REMARKS

This application has been carefully reviewed in light of the Office Action dated March 11, 2009. Claims 1, 4 to 12, 15 to 23 and 26 to 33 are pending in the application, of which Claims 1, 12 and 23 are independent. Reconsideration and further examination are respectfully requested.

Claims 1, 4 to 12, 15 to 23 and 26 to 33 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Without conceding the correctness of the rejection, Applicant has corrected a typographical error in the claims. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 1, 4 to 12, 15 to 23 and 26 to 33 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,181,445 (Lin) in view of U.S. Patent No. 6,728,401 (Hardeberg), and in further view of U.S. Patent No. 5,539,540 (Spaulding). Reconsideration and withdrawal of this rejection are respectfully requested.

The present invention concerns preventing an output of a device independent color value outside the human visual gamut, which occur by use of a mathematical model to generate color values for a color device. In order to transform a converted device independent color value into the human visual gamut, two types of processing are performed.

A first type of processing comprises the steps of:

- determining whether or not the device-independent color value has a luminance component less than zero;
- when it is determined that the luminance component is less than zero, performing the following:

- clipping the luminance component to zero; and
- setting chromaticity components of the device-independent color value to zero.

A second type of processing comprises:

- when it is determined that the luminance component is not less than zero, then performing the following:
- determining whether or not the device-independent color value is outside the human visual gamut in the device-independent color space; and
- when it is determined that the device-independent color value is outside the human visual gamut, clipping the device-independent color value to another device-independent color value in the device-independent color space on a boundary of the human visual gamut.

The purpose of both types of processing is to ensure the color value falls within the human visual gamut. In the first type of processing, a mathematical property of a certain class of color values that can be generated by the mathematical model but fall outside the human visual gamut is exploited in order to reduce processing time. Namely, if a color value has a negative luminance component, that color value cannot possibly be in the human visual gamut. In addition, such a color value can be easily clipped to a particular color value in the human visual gamut easily, namely setting all components of the color value to zero. Thus, the first type of processing is used to clip a color value to the human visual gamut using an easily exploited mathematical property of color values and the human visual gamut.

In the second type of processing, additional processing time is expended to determine if a color value having a non-negative luminance component falls within the human visual gamut. If the color value is outside the human visual gamut, then the color value is clipped to another device-independent color value in the device-independent color space on a boundary of the human visual gamut.

Therefore, the net effect of the combination of these two processes is a single process that ensures a color value falls within the human visual gamut.

Turning to specific claim language, amended independent Claim 1 is directed to a method of transforming device-dependent color values in a device-dependent color space of a color input device to device-independent color values inside a human visual gamut in a device-independent color space. The method includes the steps of providing a mathematical model for converting device-dependent color values in a device-dependent color space of the color input device to device-independent color values in the device-independent color space; converting an input device-dependent color value in the device-dependent color space generated by the color input device into a device-independent color value in the device-independent color space using the mathematical model; determining whether or not the device-independent color value has a luminance component less than zero; when it is determined that the luminance component is less than zero, performing the steps of clipping the luminance component to zero; and setting chromaticity components of the device-independent color value to zero; and when it is determined that the luminance component is not less than zero, then performing the steps of determining whether or not the device-independent color value is outside the human visual gamut in the device-independent color space; and when it is determined that the device-independent color value is outside the human visual gamut, clipping the device-independent

color value to another device-independent color value in the device-independent color space on a boundary of the human visual gamut.

In the Office Action, it is contended that either Hardeberg or Spaulding discloses the first process as some form of error correction and Lin discloses the second process as some sort of mapping function. In regard to Spaulding, nothing in Spaulding discloses or suggests clipping a color value having a negative luminance value to the human visual gamut by setting luminance and chromaticity components of the device-independent color value to zero. This is because Spaulding deals with mapping from an input color space, RGB, to a device dependent color space, such as for a display screen or a printer, without an intervening mathematical model that generates values in a color independent space. As such, in Spaulding, there is no discussion of how to clip a color value in an independent color space to the human visual gamut. Furthermore, the only reason some chromaticity components of a color value may be "set to zero" is that the device color spaces are expressed in units that span from -100 to 100 with 0 representing neutrality, which is entirely within the device gamuts. (See, for example, Fig. 3). In addition, Spaulding is entirely silent in regard to dealing with luminance values that may have non-positive values. In fact, the closest mention Spaulding makes to a such a process is in noting that "the neutral axis has remained unchanged (aside from an overall compression of the L* values to transform the input Black point to the output Black point that was introduced prior to applying the transforming functions to the input color values)."

In regard to Hardeberg, the Office Action contends that the reference discloses clipping the luminance component of a color value in a device independent color space to zero when it is determined that the luminance component is less than zero. In Hardeberg, luminance values of pixels are manipulated in a process called "contrast stretching" in which luminance

values of pixels in a region of an image are deliberately stretched toward black. As in Spaulding, the process relied upon is for manipulating device dependent color values which is not related to ensuring that color values in an independent color space fall within a human visual gamut. Specifically, in Hardeberg, the process is used to take a color out of the human visual gamut as, if the stretching process results in a zero luminance value, the chromaticity is left untouched. This is, because pixel values are being manipulated, it is merely enough to turn the pixel off in the image. As such, Hardeberg actually teaches away from the features of the present invention as the purpose of the present invention is to transform device-dependent color values in a device-dependent color space of a color input device to device-independent color values inside a human visual gamut in a device-independent color space.

In addition, none of the cited references describes the transform of the device independent color value into the human visual gamut. The Office Action, it is stated that Lin discloses a process of clipping the device-independent color value to another device-independent color value in the device-independent color space on a boundary of the human visual gamut when it is determined that the device-independent color value is outside the human visual gamut. However, the processing disclosed in Fig. 6 of Lin is only for mapping a color value outside of a device gamut into the device gamut. Lin does not describe using the human visual gamut, which is different from the device gamut. However, in the present invention, output of the device independent color value outside the human visual gamut by the use of the mathematical model is prevented. Such a technical effect cannot be achieved by Lin.

In light of these deficiencies in Lin, Spaulding and Hardeberg, Applicant submits that amended independent Claim 1 is now in condition for allowance and respectfully requests same.

Amended independent Claims 12 and 23 are directed to a data processing system and a computer-readable medium, respectively, substantially in accordance with the method of Claim 1. Accordingly, Applicant submits that Claims 12 and 23 are also now in condition for allowance and respectfully requests same.

The other pending claims in this application are each dependent from the independent claims discussed above and are therefore believed allowable for the same reasons. Because each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration of each dependent claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

CONCLUSION

No claim fees are believed due; however, should it be determined that additional claim fees are required, the Director is hereby authorized to charge such fees to Deposit Account 06-1205.

Applicant's undersigned attorney may be reached in our Costa Mesa, CA office at (714) 540-8700. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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